Data Handling Walkthrough

Usage:

Example section of submit file to use data handling:

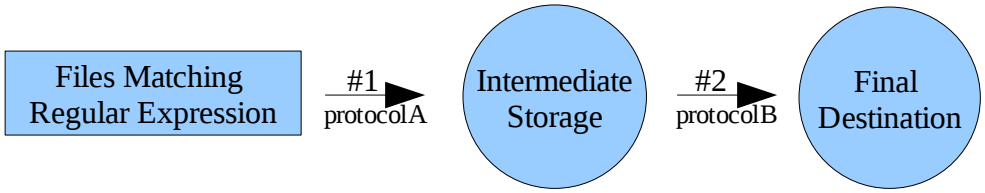
```
+WMS_OUTPUT_LOCATION="globus://fnal.gov/dir;file:///tmp/,gsiftp://fnal.gov/dir
+WMS_OUTPUT_PATTERN="outputFileName"
+WMS_MIN_TRANSFER_THRESHOLD=120000
+HookKeyword="DH"
```

Using output location waypoints, paths, and fallbacks

```
+WMS_OUTPUT_LOCATION="file:///home/glideinwms"
```
All files matching
```
+WMS_OUTPUT_PATTERN="regularExpressionPattern"
```
go to directory /home/glideinwms

Waypoints
Commas separate waypoints. Between the destination They are traversed from left to right.

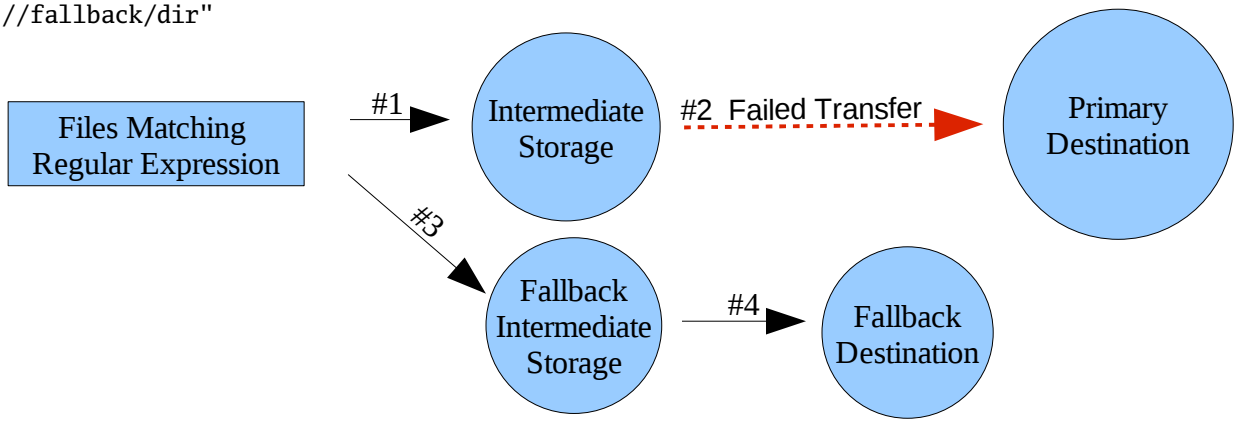
```
+WMS_OUTPUT_LOCATION="protocolA://intermediate/folder1,protocolB://final/folder2"
```



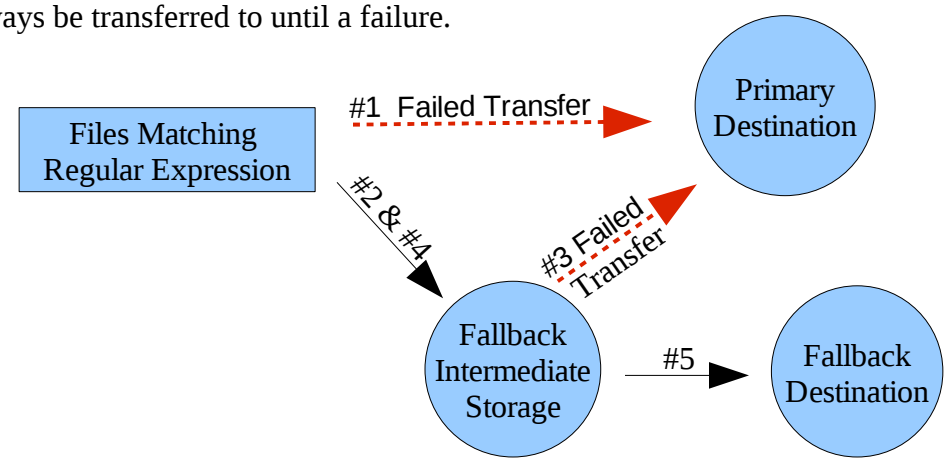
Fallbacks
Fallbacks are paths to be used if a transfer fails.

Fallbacks are separated by semi-colons. A fallback is also a path, so it may have intermediate storages as well using commas.

```
+WMS_OUTPUT_LOCATION="ftp://intermediate/dir,ftp://primary/dir;ftp://fallbackintermediate/dir,
ftp://fallback/dir"
```



Fallback paths can share intermediates and final destinations but every waypoint on a fallback path will always be transferred to until a failure.




```
+WMS_OUTPUT_LOCATION="ftp://primarydestination/;ftp://fallbackintermediate/,ftp://primarydesti
nation;ftp://fallbackintermediate/,ftp://fallbackdestination/"
```

The above configuration could be useful if there is a routing issue to the primary destination. However, the fallback intermediate will be transferred to twice if transfer #3 fails.

This is because detection of failed transfers is not guaranteed, and the following transfer could have failed because the file did not exist on the intermediate.

Protocols

It is also important to note that at each point the plugin needs to be able to read the previous destination. "`http://hostname/,smb://otherhostname/`" Will only work if an "smb" plugin can retrieve via http protocol.

Globus-url-copy can read and write to and from hosts using http, ftp, and gsiftp, making each easily interchangeable. However, "`smb://hostname/,gsiftp://otherhostname/`" Will not work, since it has no way of retrieving from the previous host's protocol.

Min Transfer Threshold

Min Transfer Threshold is the how large the transfer size should be before a new DH slot is started. Since plugins should be accurately monitoring the estimated duration, and starting a new DH slot if the transfer is going too slow, this number is recommended to be how much data could, in a best case scenario, be transferred in the time it takes for a new glidein to begin a new job.

Typically:

```
(fastest the file could be transferred over network in kilobytes per second) * (60 seconds)
```

Features:

Data Handling Management

- Activated by hook.
  - To activate must include `+HookKeyword="DH"`
- Multiple transfers can take place independently via Transfer Slots (TSlot).
- The same host will not be transferred to simultaneously by the same DH Slot.
- Will re-attempt all failed transfer paths until 3/4s of the job execution time.
  - Exponentially increases delay between retries, until delay is an hour. 2^X
- Files can fall back individually.
  - In the event of network failure, if some files transferred successfully, only the remaining files will be transferred to the fallback.
- Files are never deleted by dh_mngmnt or its default plugins. Not even for midpoints or intermediate storage.
- Final file destinations and transfer output information can be found in classads (condor_history)
- Job will vacate itself to another machine, where files on intermediate storages can be transferred
  - Requires Job to be allowed to use condor_qedit and condor_vacate_job on itself

DH Plugins

- Many protocols and tools can be supported by adding more plugins.
  - Plugin selection is based on protocol prefix
- DH Slots can be created as needed if a plugin detects a slowdown.
  - A DH slot and its plugins cannot create more than one DH slot.
  - So, a plugin does not have to check if a new slot has already been created
- Plugins detect transfer failures to allow management to attempt recovery by a fallback path.
- Plugins Terminate transfers that will take too long to finish
  - Condor will kill the glidein eventually. This allows a fallback path to be attempted.
  - Currently, if the transfers estimated time remaining is more than 12 hours for longer than a minute, the transfer is stopped and the next fallback path is used.
  - Currently the responsibility of the plugin to detect these cases.
- User may add their own plugin by downloading a file in job runtime that has a filename that matches a pattern in the execute directory
  - The pattern is `[prefix]_dh_plugin.[extension]`
    - `gsiftp_dh_plugin.sh` or `globus_dh_plugin.run`

- Since plugin can be downloaded by job, transfer method is as flexible as without data handling management
- protocol is selected for by the [prefix] in the plugin name
  - A waypoint with URL `gsiftp://hostname/` will activate the plugin `gsiftp_dh_plugin.sh`
- Since files are downloaded during job runtime, the user plugins will not be downloaded again if a job is restarted on another worker node after DH phase begins
  - Could be fixed later

How to make a plugin

Filename:

[protocol]_dh_plugin.[extension]

Plugin will only be used if the protocol matches the prefix of the URL for a waypoint

Ex: 'ftp_dh_plugin.sh' would be used for a URL starting with ftp://

Command Line Arguments

$1 - TO / Destination

- includes target filename
- might not use an existing directory

$2 - FROM / Origin file

- does not include file:// for local files. Is a full URL for all other files

$3 - FILE SIZE

- measured in kilobytes
- used to determine estimated time to transfer, which may be used to terminate transfer

Exit status

0) Transfer completed successfully
1) Transfer failed
2) The plugin does not have needed configuration on work machine
3) Transfer was taking too long

Encouraged Environment Variables

$transfer_id - unique ID for each transfer that was started by a DH slot.

- Higher numbers are started later.

$DH_LOG - the path to the UserLog dh_mgmnt uses . Gets returned to user.

- note: all standard output is redirected to this log

$DH_SLOT_CREATE will contain the shell command to execute if a new slot is needed

-typically should be used if the transfer is expected to take longer than 60 seconds

Extremely short example (`Filename: file_dh_plugin.sh`)

```
#! /bin/bash

#remove file://
from=`echo $2 | sed –e 's/file\:\/\///p'`
to=`echo $1 | sed –e 's/file\:\/\///p'`

cp $from $to

if [ $? –eq 0 ] && [ –f $2 ]; then
      exit 0
else
      exit 1
fi
```

However, plugins should monitor the transfer while in progress